IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
ANDREAS ORTH et al.

Application No.: 10/540,073

Confirmation No.: 2660

Filed: July 19, 2006

Art Unit: 1797

For: METHOD AND PLANT FOR PRODUCING LOW-TEMPERATURE COKE

Examiner: Prem C. Singh

APPEAL BRIEF

MS Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

May 3, 2010

Dear Sir:

Appellants submit this Appeal Brief in accordance with 37 C.F.R. § 41.37 in support of their appeal from the Final Office Action, mailed January 5, 2010 by Examiner Prem C. Singh, in the above-identified patent application.

In accordance with 37 C.F.R. §§ 41.31 and 41.37, this Appeal Brief follows the March 4, 2010 filing of a Notice of Appeal and payment of the required fee. Appellants submit that this Appeal Brief is timely filed within two months of the March 4, 2010 Notice of Appeal, is in furtherance of said Notice of Appeal, and is accompanied by the required fee. The filing of this Appeal Brief requires no extension of time fee. However, the Commissioner is hereby authorized to charge any unpaid fees deemed required in connection with this Appeal Brief, or to credit any overpayment, to Deposit Account No. 12-1216.

The fees required under 37 C.F.R § 41.20(b)(2) are also dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1205.2:

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I. REAL PARTY IN INTEREST

The real party in interest for this appeal is Outotec OYJ.

The inventors assigned all their respective rights in and to this application to Otokumpu Technology Oy, as recorded under Reel/Frame 021200/0691 on July 7, 2008. Otokumpu Technology Oy changed its name to Outokumpu Technology OYJ, which name change was recorded under Reel/Frame 021200/0732 on July 7, 2008. Outokumpu Technology OYJ changed its name to Outotec OYJ, which name change was recorded under Reel/Frame 021200/0754 on July 7, 2008.

II. RELATED APPEALS AND INTERFERENCES

To Appellants' knowledge, there are no other appeals, interferences or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

Claims 1-20 are pending in the present application.

B. Current Status of Claims

1. Claims canceled: 20
2. Claims withdrawn from consideration but not canceled: none
3. Claims pending: 1-19
4. Claims allowed: none
5. Claims rejected: 1-19

C. Claims On Appeal

The claims on appeal are claims 1-19

IV. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the mailing of the January 5, 2010 Final Office Action.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to a method of producing low-temperature coke, in which granular coal is heated to a temperature of 700 to 1050°C in a fluidized bed reactor by an oxygen-containing gas, comprising introducing from below a first gas or gas mixture through at least one gas supply tube with an upper orifice into a mixing chamber of the fluidized-bed reactor so as to entrain solids from a stationary annular fluidized bed into the mixing chamber when passing through the upper orifice, the at least one gas supply tube being at least partly surrounded by the stationary annular fluidized bed extending beyond the upper orifice, the solids being entrained from the stationary annular fluidized bed extending beyond the upper orifice upon the first gas or gas mixture passing through an upper orifice region; and adjusting gas velocities of the first gas or gas mixture and the fluidizing gas for the stationary annular fluidized bed such that the Particle-Froude-Number is a) in the at least one gas supply tube between 1 and 100, b) in the stationary annular fluidized bed between 0.02 and 2, and c) in the mixing chamber between 0.3 and 30. (Specification, page 1, lines 8-11, page 2, lines 21-27, page 6, lines 11-15, page 9, lines 17-20 and Figs 1-3).

Independent claim 1 recites "a method of producing low-temperature coke, in which granular coal is heated to a temperature of 700 to 1050°C in a fluidized-bed reactor [e.g., 2 in Fig. 1] by an oxygen-containing gas" (Specification, page 1, lines 8-11), and recites the steps of "introducing from below a first gas or gas mixture through at least one gas supply tube [e.g., 3 in Fig. 1]" (Specification, page 2, lines 20-21) "with an upper orifice [e.g., 3A in Fig. 1] into a mixing chamber [e.g., 8 in Fig. 1] of the fluidized-bed reactor [e.g., 2 in Fig. 1] so as to entrain solids from a stationary annular fluidized bed [e.g., 6 in Fig. 1] into the mixing chamber [e.g., 8 in Fig. 1] when passing through the upper orifice [e.g., 3A in Fig. 1]" (Specification, page 6, lines 11-15 and page 9, lines 17-20), "the at least one gas supply tube [e.g., 3 in Fig. 1] being at least partly surrounded by the stationary annular fluidized bed [e.g., 6 in Fig. 1] extending beyond the upper orifice [e.g., 3A in Fig. 1]", "the solids being entrained from the stationary annular fluidized bed [e.g., 6 in Fig. 1] extending beyond the upper orifice [e.g., 3A in Fig. 1] upon the first gas or gas mixture passing through an upper orifice region [e.g., 3A in Fig. 1]" (Specification, page 6, lines 11-17 and page 9, 17-20), "fluidizing the stationary annular fluidized bed [e.g., 6 in Fig. 1] by supplying fluidizing

gas" (Specification, page 2, lines 21-23), "and adjusting gas velocities of the first gas or gas mixture and the fluidizing gas for the stationary annular fluidized bed [e.g., 6 in Fig. 1] such that the Particle-Froude-Number is a) in the at least one gas supply tube [e.g., 3 in Fig. 1] between 1 and 100, b) in the stationary annular fluidized bed [e.g., 6 in Fig. 1] between 0.02 and 2, and c) in the mixing chamber [e.g., 8 in Fig. 1] between 0.3 and 30 (Specification, page 2, lines 23-27).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether claims 1-10 and 14-19 can properly be rejected as obvious under 35 U.S.C. § 103(a) on a combination of U.S. Patent No. 4,716,856 to Beisswenger et al ("Beisswenger") in view of U.S. Patent Application to No. 3,578,798 to Lapple et al ("Lapple").

2. Whether claims 11-13 can be properly rejected as obvious under 35 U.S.C. § 103(a) on a combination of Beisswenger in view of Lapple and further in view of U.S. Patent No. 5,560,762 to Bresser et al ("Bresser").

VII. ARGUMENT

Grounds of Rejection No. 1: Obvious rejection of claims 1-10 and 14-19 based on a combination of Beisswenger and Lapple

Beisswenger describes a fluidized bed system for burning carbonaceous fuel to provide steam by introducing fuel into a fluid bed in an upright reactor wherein the material is fluidized by a gas introduced at the bottom of the bed. See Beisswenger, column 1, lines 5-7 and column 2, lines 30-34.

Lapple describes a cyclonic fluid bed reactor including a tube 14 with passages 36 for the discharge of materials from the fluidized bed 33 into the tube 14 and vertically spaced rows of air inlets 25 to create a spiral movement in the tube 14. The solids discharged from the fluidized bed 33 through the passages 36 into the tube 14 are entrained, spiral upward into and are separated from

the gas in the freeboard space 37, and are reintroduced into the fluidized bed 33 by gravity. See Lapple, the title, column 2, lines 12-19, 43-58 and 65-69, and Figs. 1 and 2.

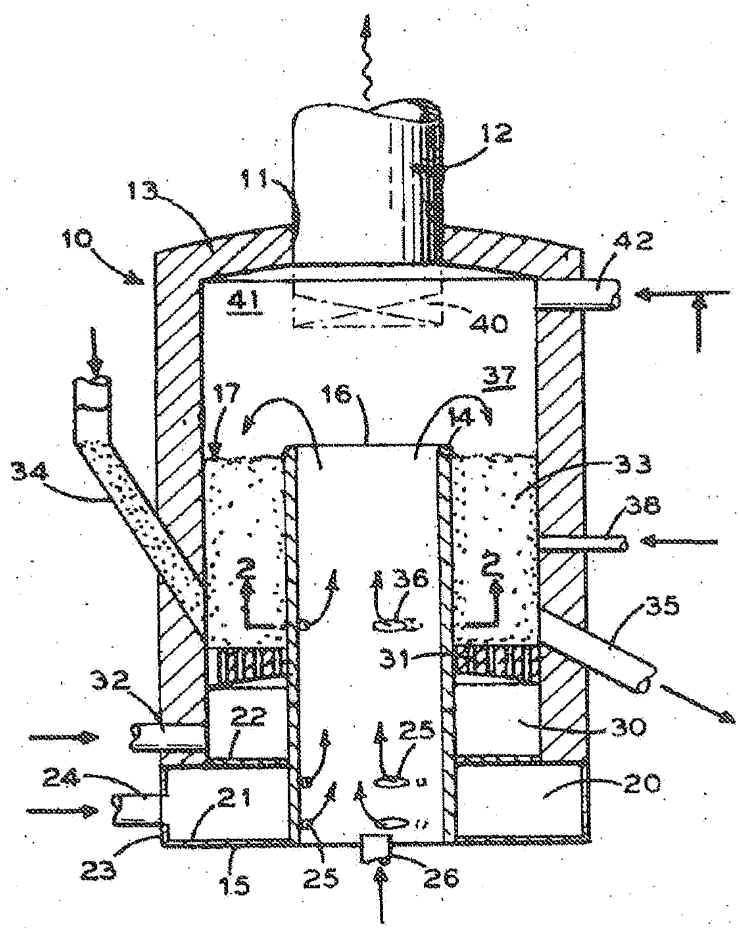
Independent claim 1 of the present application recites:

> introducing from below a first gas or gas mixture through at least one gas supply tube with an upper orifice into a mixing chamber of the fluidized-bed reactor so as to entrain solids from a stationary annular fluidized bed into the mixing chamber when passing through the upper orifice, the at least one gas supply tube being at least partly surrounded by the stationary annular fluidized bed extending beyond the upper orifice, the solids being entrained from the stationary annular fluidized bed extending beyond the upper orifice upon the first gas or gas mixture passing through an upper orifice region;
>
> … and
>
> adjusting gas velocities of the first gas or gas mixture and the fluidizing gas for the stationary annular fluidized bed such that the Particle-Froude-Number is a) in the at least one gas supply tube between 1 and 100, b) in the stationary annular fluidized bed between 0.02 and 2, and c) in the mixing chamber between 0.3 and 30.

It is respectfully submitted that neither of Beisswenger nor Lapple teach or suggest at least one gas supply tube being at least partly surrounded by a stationary annular fluidized bed extending beyond the upper orifice, with the solids being entrained from the stationary annular fluidized bed extending beyond the upper orifice upon the first gas or gas mixture passing through an upper orifice region as recited in claim 1. As noted by the Examiner, Beisswenger does not teach a gas supply tube surrounded by a stationary annular fluidized bed and does not teach the entrainment of solids from the stationary annular fluidized bed. See Final Office Action dated January 5, 2010, Detailed Action, page 4, lines 1-3. Lapple does not cure this defect. Specifically, Lapple does not teach or suggest a "gas supply tube being at least partly surrounded by the stationary annular fluidized bed extending beyond the upper orifice" of the gas supply tube as required by claim 1 of the present application. In contrast, Lapple describes a fluidized bed construction with a central tube 14 and 55 which rises "above the normal level of the fluidized bed." See Lapple, column 1, lines 26-30 (emphasis added). Thus, the fluidized bed of Lapple nowhere extends beyond an upper

orifice of tubes 14, 55, as required by claim 1. The rising of the central tubes 14 and 55 above the level of the fluidized bed in Lapple is clearly shown in Figs. 1 and 3. Applicants have inserted Figs. 1 and 3 of Lapple as well as a relevant respective cutout thereof to demonstrate this difference:

Fig. 1



Cutout of Fig. 1

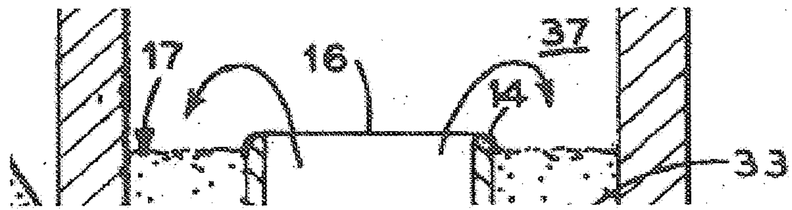
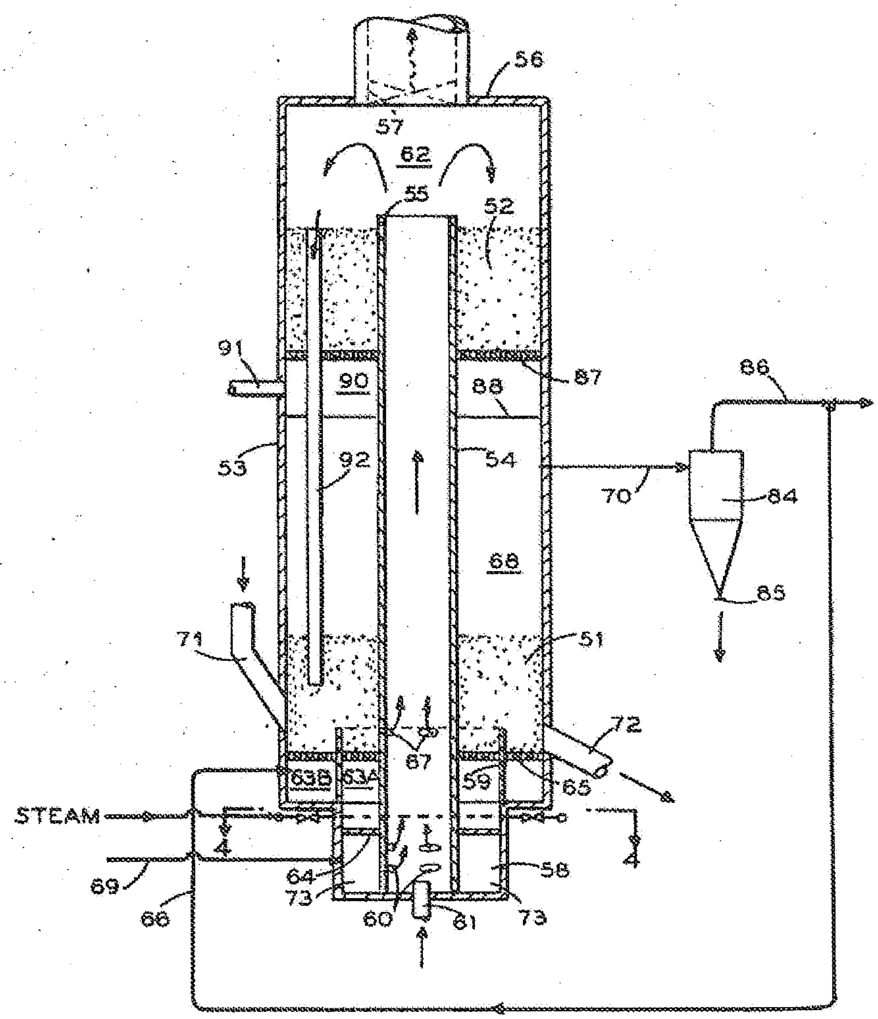
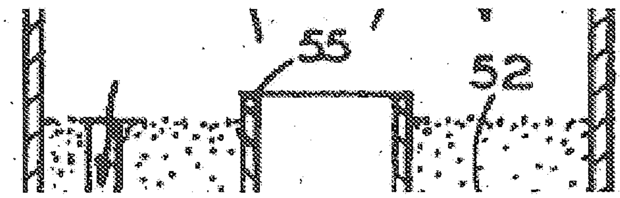


Fig. 3

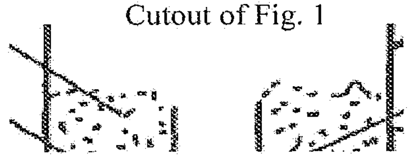


Cutout of Fig. 3

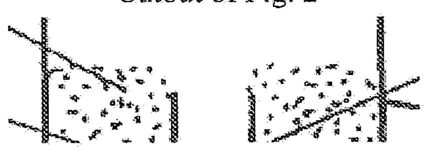


Merely as a comparison, Figs. 1-3 of the present application clearly show a "gas supply tube being at least partly surrounded by the stationary annular fluidized bed extending beyond the upper orifice" of the gas supply tube.

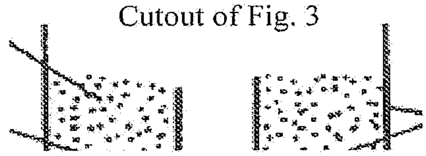
Cutout of Fig. 1



Cutout of Fig. 2



Cutout of Fig. 3



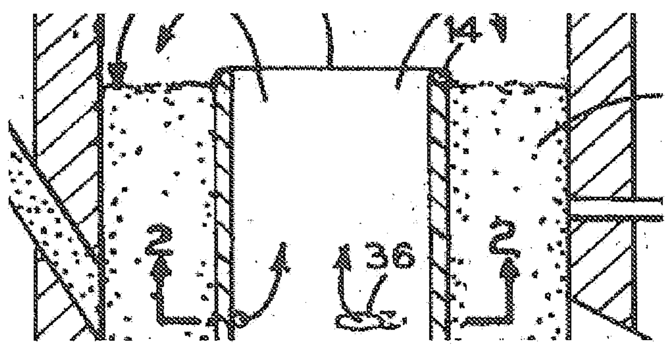
Lapple also does not teach or suggest "entrain[ing] solids from a stationary annular fluidized bed extending beyond the upper orifice upon the first gas or gas mixture passing through the upper orifice region," as required by claim 1 of the present application. In contrast, Lapple describes a system where each of the central tubes 14 and 55 has passageways through which particles are introduced into the central tube 14. See Lapple, Figs. 2 and 4. Lapple itself states:

> The wall of the tube is provided with one or more passageways therethrough which are arranged tangentially with respect to the wall of the tube and communicate with the surrounding fluidized bed. With this arrangement, granular or particle-form material will be withdrawn from the fluidized bed and introduced tangentially into the central tube where the materials are entrained by the flowing fluid, lifted to the top of the tube and then discharged outwardly into the annular space surrounding the tube to separate from the fluid.

See Lapple, column 1, lines 31-40 and Fig. 1. See also Lapple, column 4, lines 8-11.

Fig. 1 of Lapple shows tangentially arranged passages 36 in tube 14 through which passages particles are entrained. Passages 36 are arranged towards the middle section of tube 14 and not at an upper orifice region as is required by claim 1. Fig. 3 shows passages 67 at the bottom of tube 55. The Applicants have inserted a cutout of the relevant portion of Fig. 1 of Lapple to demonstrate this difference:

Cutout of Fig. 1



Moreover, the design of Lapple makes it impossible to entrain solids from a stationary annular fluidized bed extending beyond any upper orifice of the tube 14 or 55, as required by claim 1, because, as already noted above, tube 14 or 55 of Lapple extends above the level of the fluidized bed so that nowhere does the fluidized bed of Lapple extend beyond an upper orifice of tube 14, 55. The Final Office Action contends that:

> [I]n a continuous, steady operation, the level of the bed [17] is expected to rise and will be flushed with the end of the tube [16]. Thus, it is expected that in the Lapple invention, the solids will also be entrained from the stationary annular fluidized bed extending beyond the

> upper end of the central tube upon the gas passing through the end of the tube, similar to the Applicant's claim.

See Final Office Action dated January 5, 2010, Detailed Action, page 4, lines 15-19 as well as page 10, line 18 to page 11, line 2. It is respectfully submitted that Lapple itself contains no such teaching or suggestion. In contrast, "Lapple discloses providing a central tube which leads upwardly through the fluidized bed into the freeboard space above the normal level of the fluidized bed," as acknowledged in the Final Office Action itself. See Final Office Action dated January 5, 2010, Detailed Action, page 10, lines 13-16.

It is furthermore respectfully submitted that neither Beisswenger nor Lapple teach or suggest "adjusting gas velocities of the first gas or gas mixture and the fluidizing gas for the stationary annular fluidized bed such that the Particle-Froude-Number is a) in the at least one gas supply tube between 1 and 100, b) in the stationary annular fluidized bed between 0.02 and 2, and c) in the mixing chamber between 0.3 and 30," as required by claim 1 of the present application. In contrast, Beisswenger merely describes a typical Froude number range for a circulating fluidized bed reactor that may define overall reactor operating conditions. See Beisswenger, column 2, lines 48-69. Beisswenger nowhere teaches establishing differing Froude ranges in different portions of the chamber of an *annular fluidized bed reactor*, i.e., the gas supply line, annular fluidized bed and mixing chamber, as required in claim 1. Nor therefore does Beisswenger teach the combination of Froude number ranges recited in claim 1. Indeed, it would not be possible for Beisswenger to teach the required Froude number ranges because, as already noted above, and as acknowledged by the Final Office Action, Beisswenger does not teach a gas supply tube surrounded by a stationary annular fluidized bed. See Final Office Action dated January 5, 2010, Detailed Action, page 4, lines 1-3. Regarding Lapple, that reference does not teach Froude numbers at all. Lapple moreover recites an annular fluidized bed reactor. A person of ordinary skill in the art would therefore not have attempted to apply the Froude numbers of Beisswenger relating to a circulating fluidized bed reactor to control the annular fluidized bed reactor of Lapple because two different types of reactors with two different gas velocities are involved.

Because each of Beisswenger and Lapple are missing at least the aforementioned features recited in claim 1, it is respectfully submitted that any combination of Beisswenger and Lapple, to

the extent proper, could not render claim 1 or any of its dependent claims obvious. A combination of Beisswenger in view of Lapple, to the extent proper, could not render dependent claims 2-10 and 14-19 obvious.

Grounds of Rejection No. 2: Obvious rejection of claims 11-13 based on a combination of Beisswenger, Lapple and Bresser

Beisswenger and Lapple were described above.

Bresser describes a process for the heat treatment of fine-grained iron ore in a circulating fluidized bed system for the conversion of the heat-treated iron ore to metallic iron in a conventional fluidized bed. See Bresser, column 1, liens 9-11 and column 2, lines 15-17 and 29-31.

It is respectfully submitted that each of claims 11-13 properly depend on claim 1. As stated above, none of Beisswenger and Lapple disclose the features of at least one gas supply tube being at least partly surrounded by a stationary annular fluidized bed extending beyond the upper orifice, with the solids being entrained from the stationary annular fluidized bed extending beyond the upper orifice upon the first gas or gas mixture passing through an upper orifice region as required by claim 1, nor do Beisswenger and Lapple teach or suggest adjusting gas velocities of the first gas or gas mixture and the fluidizing gas for the stationary annular fluidized bed such that the Particle-Froude-Number is a) in the at least one gas supply tube between 1 and 100, b) in the stationary annular fluidized bed between 0.02 and 2, and c) in the mixing chamber between 0.3 and 30., as required by claim 1 of the present application. Bresser does not cure the aforementioned deficiencies of the combination of Beisswenger and Lapple. Therefore, a combination of Beisswenger in view of Lapple and further in view of Bresser, to the extent proper, could not render dependent claims 11-13 obvious.

Because each of Beisswenger, Lapple and Bresser are missing at least the aforementioned features recited in claim 1, it is respectfully submitted that any combination of Beisswenger, Lapple and Bresser, to the extent proper, could not render claim 1 or any of its dependent claims obvious. A combination of Beisswenger in view of Lapple in view of Bresser, to the extent proper, could not render dependent claims 11-13 obvious.

VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A.

CONCLUSION

In view of the above amendment, Applicants believe the pending application is in condition for allowance.

The Commissioner is hereby authorized to charge any unpaid fees deemed required in connection with this submission, including any additional filing or application processing fees required under 37 C.F.R. §1.16 or 1.17, or to credit any overpayment, to Deposit Account No. 12-1216.

Dated: May 3, 2010

Respectfully submitted,

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Attachments: Appendices A, B and C

APPENDIX A

Claim 1 (Previously Presented): A method of producing low-temperature coke, in which granular coal is heated to a temperature of 700 to 1050°C in a fluidized-bed reactor by an oxygen-containing gas, comprising:

introducing from below a first gas or gas mixture through at least one gas supply tube with an upper orifice into a mixing chamber of the fluidized-bed reactor so as to entrain solids from a stationary annular fluidized bed into the mixing chamber when passing through the upper orifice, the at least one gas supply tube being at least partly surrounded by the stationary annular fluidized bed extending beyond the upper orifice, the solids being entrained from the stationary annular fluidized bed extending beyond the upper orifice upon the first gas or gas mixture passing through an upper orifice region;

fluidizing the stationary annular fluidized bed by supplying fluidizing gas; and

adjusting gas velocities of the first gas or gas mixture and the fluidizing gas for the stationary annular fluidized bed such that the Particle-Froude-Number is a) in the at least one gas supply tube between 1 and 100, b) in the stationary annular fluidized bed between 0.02 and 2, and c) in the mixing chamber between 0.3 and 30.

Claim 2 (Previously Presented): The method as claimed in claim 1, wherein the Particle-Froude-Number in the at least one gas supply tube is between 1.15 and 20.

Claim 3 (Previously Presented): The method as claimed in claim 1 wherein the Particle-Froude-Number in the stationary annular fluidized bed is between 0.115 and 1.15.

Claim 4 (Previously Presented): The method as claimed in claim 1, wherein the Particle-Froude-Number in the mixing chamber is between 0.37 and 3.7.

Claim 5 (Previously Presented): The method as claimed in claim 1, wherein solids are discharged from the fluidized-bed reactor and separated in a separator, wherein part of the solids or an amount of a product stream are recirculated to the stationary annular fluidized bed.

Claim 6 (Previously Presented): The method as claimed in claim 5, wherein the amount of the product stream recirculated to the stationary annular fluidized bed is controlled by a difference in pressure above the mixing chamber.

Claim 7 (Previously Presented): The method as claimed in claim 1, wherein granular coal having a grain size of less than 10 mm is supplied to the fluidized-bed reactor as a starting material.

Claim 8 (Previously Presented): The method as claimed in claim 1, wherein granular coal is a highly volatile coal and the highly volatile coal is supplied to the fluidized-bed reactor as starting material.

Claim 9 (Previously Presented): The method as claimed in claim 1, wherein the fluidizing gas supplied to the fluidized-bed reactor is air.

Claim 10 (Previously Presented): The method as claimed in claim 1, wherein the pressure in the fluidized-bed reactor is between 0.8 and 10 bar.

Claim 11 (Previously Presented): The method as claimed in claim 1, wherein iron ore is additionally supplied to the fluidized-bed reactor.

Claim 12 (Previously Presented): The method as claimed in claim 11, wherein the iron ore is preheated before being supplied to the fluidized-bed reactor.

Claim 13 (Previously Presented): The method as claimed in claim 11, wherein the iron ore and low-temperature coke withdrawn from the fluidized-bed reactor has a weight ratio of iron to carbon of 1:1 to 2:1.

Claim 14 (Previously Presented): A plant for producing low-temperature coke by the method recited in claim 1, comprising a fluidized-bed reactor, wherein the fluidized-bed reactor includes:

at least one gas supply system tube with an upper orifice at least partially surrounded by an annular chamber in which a stationary annular fluidized bed is located, wherein the stationary annular fluidized bed extends beyond the upper orifice, so that a first gas or gas mixture flowing through the at least one gas supply tube entrains solids from the stationary annular fluidized bed into the mixing chamber when passing through the upper orifice; and

a mixing chamber located above the upper orifice of the at least one gas supply tube.

Claim 15 (Previously Presented): The plant as claimed in claim 14, wherein the has at least one gas supply tube in the lower region of the fluidized-bed reactor extends upwards substantially vertically into the mixing chamber of the fluidized-bed reactor.

Claim 16 (Previously Presented) The plant as claimed in claim 15, wherein the at least one gas supply tube is arranged approximately centrally with reference to the crosssectional area of the fluidized-bed reactor.

Claim 17 (Previously Presented): The plant as claimed in claim 14, wherein downstream of the fluidized-bed reactor there is provided a separator for separating solids, which has a solids return conduit leading to the annular fluidized bed of the fluidized-bed reactor.

APPENDIX B

No evidence pursuant to 37 C.F.R. §§ 1.130, 1.131 or 1.132 or entered by or relied upon by the Examiner is being submitted.

APPENDIX C

No related proceedings are referenced in II. Above, hence copies of decisions in related proceedings are not provided.